Thought question

Feature integration theory says that spatially directed attention is required to correctly “bind” feature information. Suppose that we run the following experiment. Participants are asked to fixate at the center of a screen, where a number will be presented that they have to report. At the same time, in the visual periphery we rapidly present pairs of colored letters (T L). After participants have correctly reported the central number, we ask them to also describe what they have seen in the periphery. If Feature Integration Theory is right, what should we expect to observe?

Does the dual task cost of using cell phones while driving decrease with practice?

Cooper, J., & Strayer, D. L. (2008). Effects of Simulator Practice and Real World Experience on Cell-phone-Related Driver Distraction. *Human Factors , 50, 893-902.*

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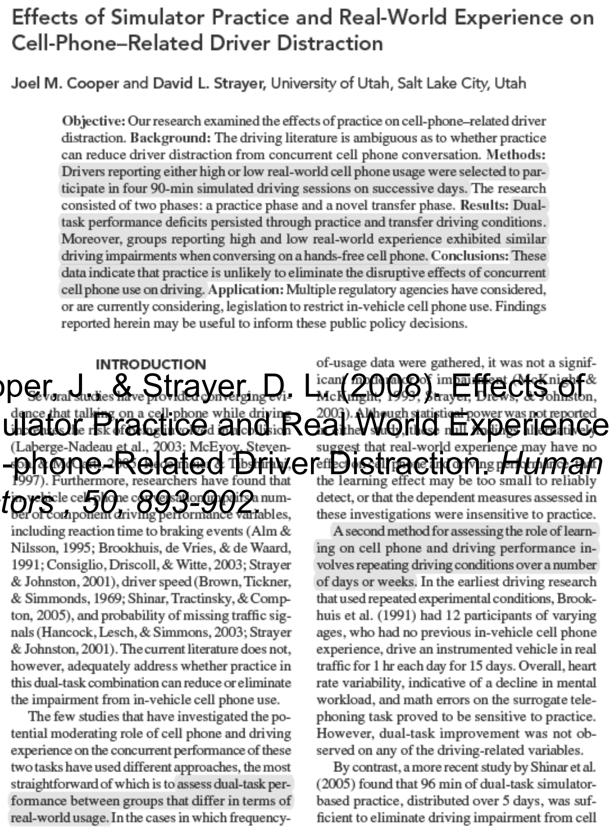

Effects of Simulator Practice and Real-World Experience on Cell-Phone–Related Driver Distraction

Joel M. Cooper and David L. Strayer, University of Utah, Salt Lake City, Utah

Objective: Our research examined the effects of practice on cell-phone–related driver distraction. **Background:** The driving literature is ambiguous as to whether practice can reduce driver distraction from concurrent cell phone conversation. **Methods:** Drivers reporting either high or low real-world cell phone usage were selected to participate in four 90-min simulated driving sessions on successive days. The research consisted of two phases: a practice phase and a novel transfer phase. **Results:** Dual-task performance deficits persisted through practice and transfer driving conditions. Moreover, groups reporting high and low real-world experience exhibited similar driving impairments when conversing on a hands-free cell phone. **Conclusions:** These data indicate that practice is unlikely to eliminate the disruptive effects of concurrent cell phone use on driving. **Application:** Multiple regulatory agencies have considered, or are currently considering, legislation to restrict in-vehicle cell phone use. Findings reported herein may be useful to inform these public policy decisions.

INTRODUCTION

Several studies have provided converging evidence that talking on a cell-phone while driving increases the risk of being involved in a collision (Laberge-Nadeau et al., 2003; McEvoy, Stevenson & McCartt, 2005; Redelmeier & Tibshirani, 1997). Furthermore, researchers have found that in-vehicle cell phone conversation impairs a number of component driving performance variables, including reaction time to braking events (Alm & Nilsson, 1995; Brookhuis, de Vries, & de Waard, 1991; Consiglio, Driscoll, & Witte, 2003; Strayer & Johnston, 2001), driver speed (Brown, Tickner, & Simmonds, 1969; Shinar, Tractinsky, & Compton, 2005), and probability of missing traffic signals (Hancock, Lesch, & Simmons, 2003; Strayer & Johnston, 2001). The current literature does not, however, adequately address whether practice in this dual-task combination can reduce or eliminate the impairment from in-vehicle cell phone use.

The few studies that have investigated the potential moderating role of cell phone and driving experience on the concurrent performance of these two tasks have used different approaches, the most straightforward of which is to assess dual-task performance between groups that differ in terms of real-world usage. In the cases in which frequency-of-usage data were gathered, it was not a significant moderator of impairment (McKnight & McKnight, 1993; Strayer, Drews, & Johnston, 2003). Although statistical power was not reported in either study, these null findings alternatively suggest that real-world experience may have no effect on cell phone and driving performance, that the learning effect may be too small to reliably detect, or that the dependent measures assessed in these investigations were insensitive to practice.

A second method for assessing the role of learning on cell phone and driving performance involves repeating driving conditions over a number of days or weeks. In the earliest driving research that used repeated experimental conditions, Brookhuis et al. (1991) had 12 participants of varying ages, who had no previous in-vehicle cell phone experience, drive an instrumented vehicle in real traffic for 1 hr each day for 15 days. Overall, heart rate variability, indicative of a decline in mental workload, and math errors on the surrogate telephoning task proved to be sensitive to practice. However, dual-task improvement was not observed on any of the driving-related variables.

By contrast, a more recent study by Shinar et al. (2005) found that 96 min of dual-task simulator-based practice, distributed over 5 days, was sufficient to eliminate driving impairment from cell

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Automaticity and Consciousness

- Automatic: **Unconscious**
  - without attention
  - without *intention*
  - rapid
  - inflexible (obligatory)
- Controlled: **Conscious**
  - with attention
  - with *intention*
  - slow
  - flexible (non-obligatory)

Learning automaticity

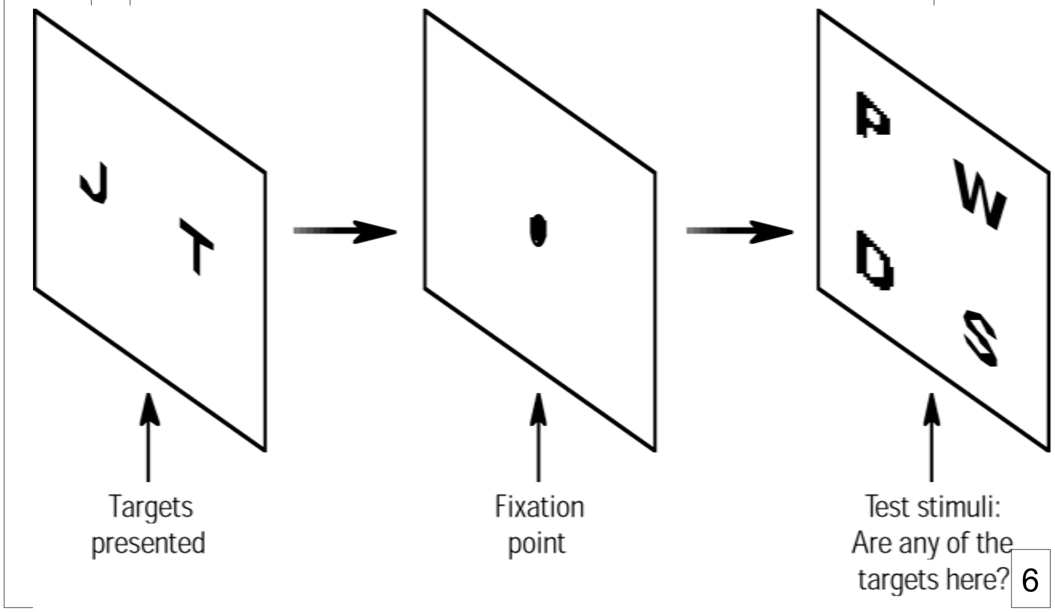
With practice, can we learn to do things in a way that will not require attention?

Shiffrin and Schneider (1977)

Task:

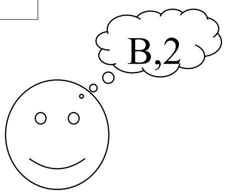
- Get a set of targets to remember
- Then get a set of test stimuli
- Have to indicate whether any of the targets are in the test set.

Example

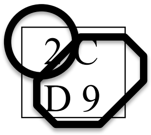


Different conditions

- Varied mapping condition = DIFFICULT
  - targets & distractors mixed



Memory Set: Consonant or Number

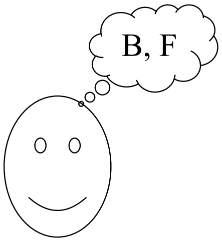


Distractors: Consonant
or Number

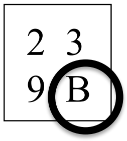
Also varied display size

Different conditions

- Consistent mapping condition = EASY
  - **targets** = consonants
  - **distractors** = numbers



Memory Set: Consonants



Distractors: Numbers

Results for DIFFICULT condition (varied mapping)

- ✓ As display size increased, response times increased too.
- ✓ So varied mapping required attention.
- ✓ This is known as CONTROLLED PROCESSING.

No amount of practice removes this effect.

Results for EASY CONDITION (consistent mapping)

- ✓ As display size increased, response times stayed about the same.
- ✓ So consistent mapping did not require attention.
- ✓ This is known as AUTOMATIC PROCESSING.

Creating automaticity

Follow-up experiment with different consistent mapping task:

- Divided consonants into two sets (B - L) and (Q - Z)
- Task is to find search items from set (B - L) among distracter items from (Q - Z)
- Initially looks like controlled task
- After 2100 trials performance was like letter/digit task

Creating automaticity

In other words, practice turned discriminating B-L from Q-Z into a task that the system could perform without the use of attentional resources!

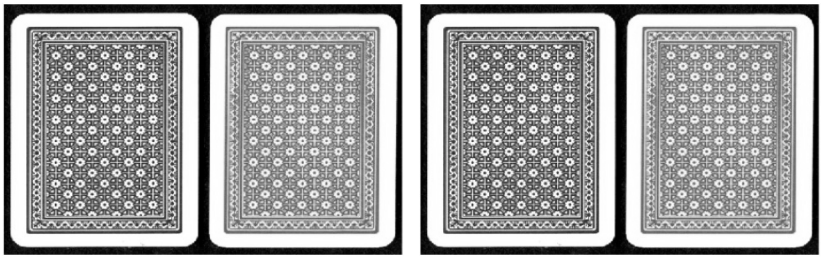
Characteristics of automaticity

- Fast
- Requires few or no attentional resources
- Obligatory
- Inflexible

- Outside of consciousness

What kinds of things can be done without consciousness?

Example: Gambling task



- Red decks: high rewards but also big losses; will ultimately lose $$
- Blue decks: modest rewards, but also modest losses; will gain $$

Self-report

- By 50 cards: People self-report a preference for the blue decks, but cannot explain exactly why
- By 80 cards: People have figured it out and can explain why the red decks are less good than the blue

But … measure sweating on palms (sign of anxiety)

- People begin to show increased sweating before selecting from the red decks after about 10 cards – that is, 40 cards before they report having a hunch that the blue decks are better!
- Behavior changes at the same time (people begin favoring blue decks)

UNCONSCIOUS RECOGNITION

HEMINEGLECT:

- Patients “ignore” one side of space. Behavior suggests that they are unconscious of those stimuli.
- Yet, some information gets through. For example, patient may refuse to eat from a plate if an insect has been placed on the unattended side.

Patients cannot explain their behavior.

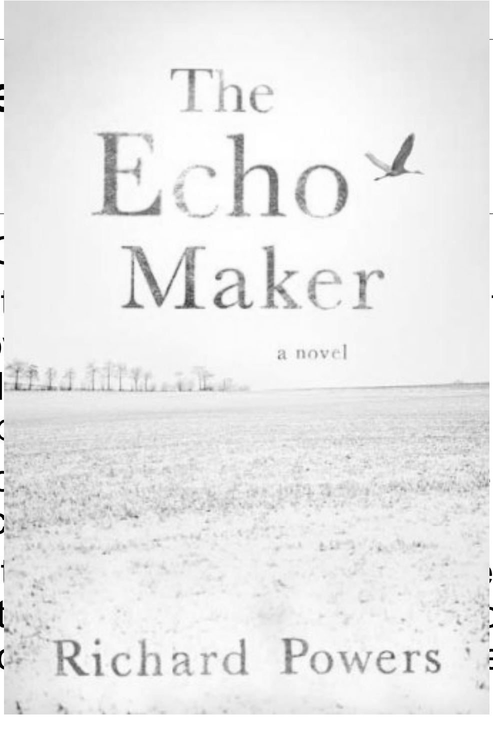
UNCONSCIOUS RECOGNITION

PROSOPAGNOSIA:

- No conscious ability to recognize familiar faces.
- However, psychophysiological methods (galvanic skin response, eye movement patterns) show that some brain areas still distinguish familiar and unfamiliar faces

“Covert” recognition.

When cove
wrong …



CAPC

- Pa faces.
  Ho
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- Pro rt
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★ Pa people
  but opriate
  unc ecognition.

UNCONSCIOUS MEMORY

AMNESIA:

Profound difficulty creating new memories.

Yet can see evidence that system is changing with experience (priming).

Priming in patients

Patient shown a list of words, one of which is “licorice.” Later, cannot recall any words from list or recognize whether or not “licorice” was on the list.

Yet, when asked to write down “the first word that comes to mind” in response to the cue “li_____” will give “licorice” (even though *not* a typical completion).

Priming (in normal subjects)

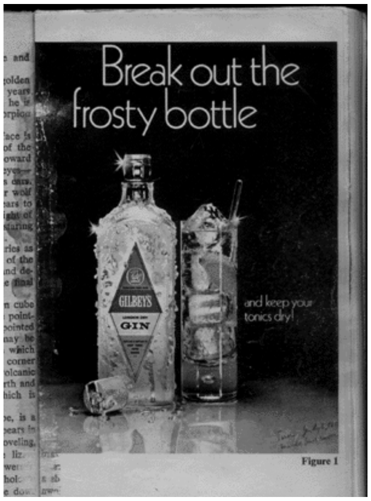
Another example of priming:

Must respond to the word “college” (the target). Faster if have previously seen “university” than “octopus” (the primes).

What happens if you show primes quickly, so that subjects can’t report seeing the prime?

Still get priming from related words!

Priming in advertising …



Priming in advertising …

UNCONSCIOUS LEARNING

Patients with amnesia can also learn new skills (for example, learn a sport) even though they don't remember ever having done the activity before.

Sequence learning in non-patients

- Subjects have to perform a task such as pressing one of several buttons in response to one of several lights becoming active.
- Unbeknownst to the subject, the lights come on in a particular pattern.
- Subjects become faster, even though cannot consciously report a sequence.
- IMPLICIT LEARNING
- Such learning likely plays a fundamental role in language, music, sports, etc.

Limits to unconscious learning

Subliminal learning

Greenwald et al. (1991)

- **Two Groups**
  - Self-Esteem
  - Memory
- **Two Tapes**
  - Self-Esteem
  - Memory
- ***Misleading Labels***
  - Half of “Memory” Tapes labeled “Self-Esteem”
  - Vice Versa

Results

tape content

labels

	Self-Esteem Tape	*Memory Tape*
Self-Esteem Group		
Memory Group		

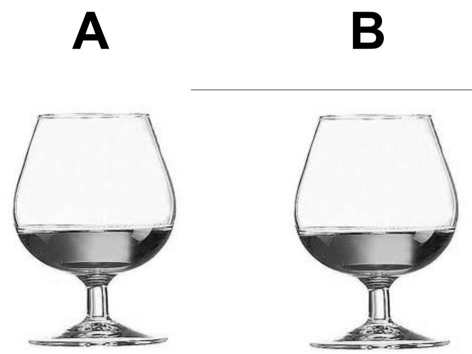
Interpretation

- Conscious expectations (about what would be learned) affected outcome.
- Unconscious material (what was actually presented) did not.

Example: Taste test

- Two types of brandy
  - **Christian Brothers**
  - E & J
- Christian Brothers was beginning to lose market share to E & J, despite:
  - same price
  - same availability
  - same level of advertising

Taste test 1



- No difference

Taste test 2 (labeled)

C.B. E&J

- Now Christian Brothers won

Taste test 3 (with bottle)

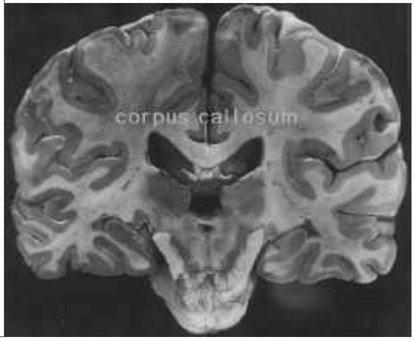
- Now E & J won!
- BUT … no tester reported anything about the bottle in explaining their choice

So Christian Brothers redesigned their bottle …

OTHER UNCONSCIOUS PROCESSES …

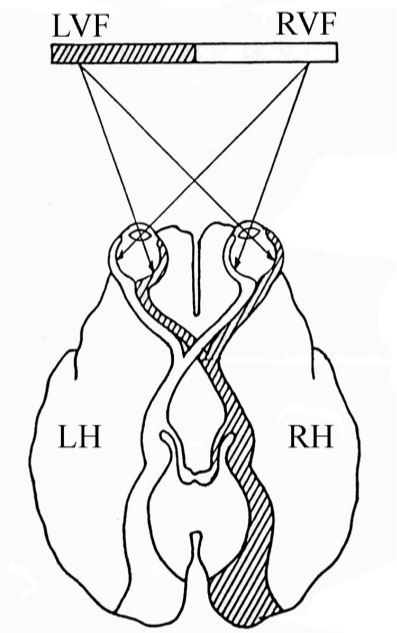
“Split-brain” patients:

Patients with intractable epilepsy who have had their *corpus callosum* cut. This is the bundle of nerve fibers that connects the right and left hemispheres. The two hemispheres then act independently.



Split-brain patients

One can make use of the way the visual pathways are set up to communicate with one hemisphere or the other.



Split-brain patients

Since the left hemisphere controls speech, patients can talk normally about stimuli that are shown to the left hemisphere.

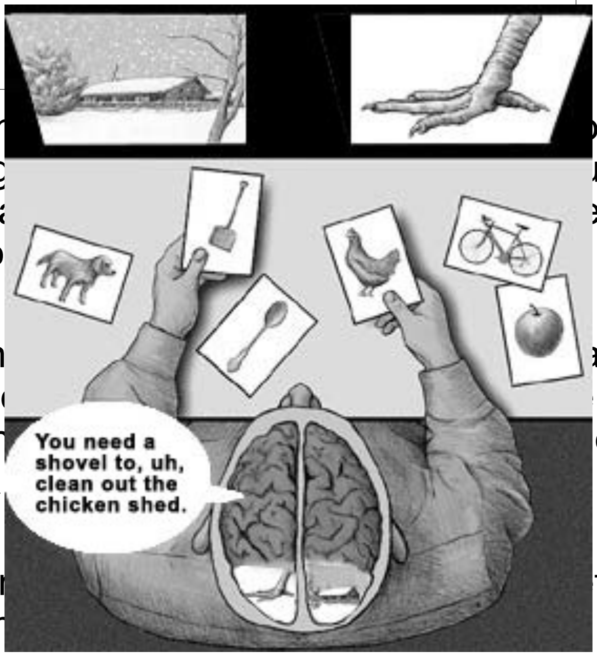
The right hemisphere cannot talk. But can communicate by controlling the left hand to point.

Split-brain patients

Both hemispheres seem to have a complex appreciation of the world and occasionally have different preferences and goals.

One patient experienced problems getting dressed, as his two hands would pick out different clothing and “fight” one another. In other cases, the right and left hemispheres preferred different political candidates or different occupations.

Split brain and consciousness


You need a shovel to, uh, clean out the chicken shed.

Alth omplex
cog us
awa e’s
pro

Wh an
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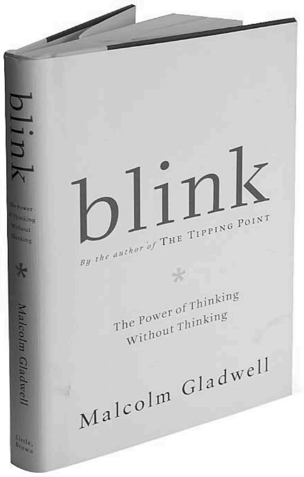
More examples …


blink
By the author of THE TIPPING POINT
The Power of Thinking Without Thinking
Malcolm Gladwell

Summary

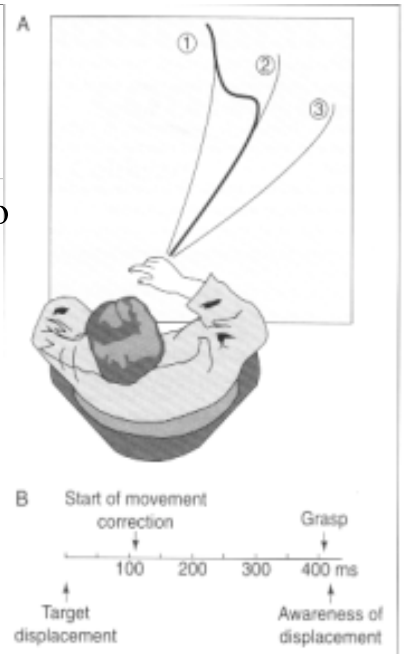
- many important aspects of processing are not accessible to consciousness
  - recognition
  - memory
  - learning
  - decision-making
- different subcomponents of cognition come into consciousness in different ways (get specific deficits of cognition)

What does consciousness do?

- **Need to maintain a sense of coherence to our behavior, even if that requires “making up stories”.**
  - Consciousness linked to the left hemisphere and perhaps to language.
- **Consciousness links up, “explains”, and monitors unconscious processing.**
  - awareness often follows behavior
  - perception of will (or choice) often imposed after the fact.

“Lagging behind”

Subject uses a joystick to follow a moving trajectory. Is supposed to squeeze to indicate that a trajectory change has occurred.



Awareness of change comes after correction for change has begun!

Illusory Will (Brasil-Neto, et al., 1992)

- Participants asked to move LEFT or RIGHT finger in response to a click
- Experimenters delivered TMS to LEFT or RIGHT motor strip
  - – significantly determined which finger would move
  - – report that subjects were unaware of the influence of the stimulus on their finger choice

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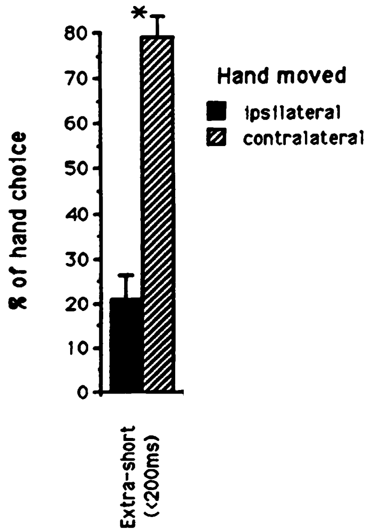
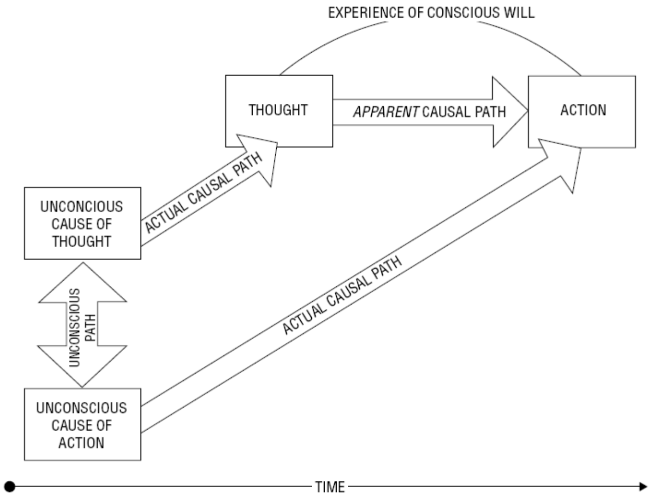
Illusory Will (Brasil-Neto, et al., 1992)



Authorship



Automatic (unconscious)	**Controlled (conscious)**
Uses few (if any) attentional resources	Uses attentional resources
Rapid (one second or less)	Relatively slow (several seconds)
Without intention	With intention
Can’t introspect about	Can introspect about
Inflexible	**Flexible**

Conclusions

- Consciousness is an important way that the brain deals with novel, challenging, informative events.
- Conscious experience accesses many knowledge sources.
- Creates coherent perceptions and controls actions.
- Important for self-monitoring and self-reflection.

Thought question

- How might the authorship model explain the development of “automatic” processing? That is, according to this model, what is likely to be changing as a process becomes automatic? How does this differ from the more standard view of automaticity?